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Canada, Mines, Bureau of Explosives
Division

CANADA

DEPARTMENT OF MINES

HON. W. A. GORDON, MINISTER: CHARLES CAMSELL, DEPUTY MINISTER

EXPLOSIVES DIVISION

LT.-COL. G. OGILVIE, CHIEF INSPECTOR

ANNUAL REPORT

OF THE

EXPLOSIVES DIVISION

OF THE

DEPARTMENT OF MINES

FOR THE CALENDAR YEAR

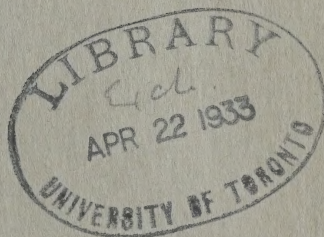
1932



OTTAWA

J. O. PATENAUDE, ACTING KING'S PRINTER

1933



No. 33



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ANNUAL REPORT
OF THE
EXPLOSIVES DIVISION OF THE DEPARTMENT OF MINES
FOR THE CALENDAR YEAR 1932

BY

Lt.-Col. G. Ogilvie, C.M.G.

The following report deals with the administration of the Explosives Act during the year ending December 31, 1932.

MANUFACTURE OF EXPLOSIVES

A list of the licensed factories, with their locations, is given in Appendix A. There is no change in this list to record. The factory of the North Star Explosives Company at Prescott, Ontario, was not opened for operation in the course of the year but remained under licence.

Inspectors of the Division made 30 inspections of factories, and one supplementary inspection of a fireworks factory was made by a deputy inspector of the Royal Canadian Mounted Police. The regulations and terms of licence were well observed.

In the larger factories the influence of the activities of the Safety Committees and of the awards to units, based on the periods of freedom from accident, inaugurated by the manufacturers several years ago, has been observable in the cultivation of the workers' interest in safety measures. The continuous following of a carefully planned routine, forming a habit which becomes as second nature, no doubt makes for safety, but such benefit is vastly enhanced when, to the preservation of good habits, is added a quickened interest in their bearing on safe operation. The worker, not relaxing his observance of ordered procedure, yet examines small details, be they of equipment or procedure, met with in his daily round, and is able to submit, for the consideration of the Safety Committee and management, suggestions designed always towards the elimination of known or conceivable risks. Thus, appreciation of the importance of the removal of matches or other prohibited articles from one's person before entering a danger area, and fear of the possibility of overlooking the self-search in the change house, prompted an employee to suggest the installation of an automatic reminder. This, which was adopted, took the form of the sudden illumination of a warning sign, effected by the man stepping on a contact board as he, having already changed, was about to punch his card on going to work. Again, the simple remedy of rounding off the

square ends of trucks evidently, judged by previous unfortunate experience, saved truckers' fingers from being broken or crushed. Of a more technical character was the valuable suggestion, put forward by an employee, to spray the wash waters in the catch box inside the nitroglycerine neutralizing house. This was instrumental in obtaining a more complete recovery there of the small quantities of nitroglycerine in the waste waters, so that the amount collected in the outside catch boxes was so very small that the cleaning out of these in cold weather became unnecessary, and the dangers attendant on the possible presence of frozen crystals avoided.

The production of high explosives and black powders (Appendix B, Classes I to III) was approximately 16,173 tons, being a decrease of 22 per cent from that of 1931. As practically all the blasting explosives used are made in Canada, and very little imported, the production is a measure of the demand. The production rose steadily from 1921 to 1929, since when it has fallen, and now stands slightly below the figure for 1925.

ACCIDENTS IN FACTORIES

No accident in manufacturing operations resulted in loss of life, but in three cases the operators involved sustained burns. The injuries to two were of a minor character, but the third, although discharged from hospital after lengthy and successful treatment, is not yet fully recovered.

This accident occurred in the T. W. Hand Fireworks factory at Dixie, Ontario, on January 26. The victim, Albert Brown, was engaged, alone, in filling candles in a separate building licensed for that purpose. In carrying out this operation the empty candle cylinders are placed in position in the candle-filling machine; a small measured portion of the powder charge inserted in each, that pressed down by the plungers of the machine, a star then put in each and that in turn pressed down. A further small measure of powder is then added, pressed down, then a star, and so on alternately until the cylinders have received their complete charges. It appears that when one of these small charges was being pressed down the composition flashed, and this communicated with and ignited the supply of about 20 pounds of composition on a side bench. Brown had got well clear of the building when reached by employees who had run to his aid. His position when at work was near the door, but his burns were of more serious a nature than was to be apprehended, having regard to the expectancy of a very brief interval between the first flash and his escape. He had no recollection of events immediately subsequent to the explosion. The ignition was evidently brought about by friction between a descending plunger and composition on the inner wall of a possibly tight, or slightly uneven, cylinder.

An employee, Stanley Morris, of the Macdonald Metal Products Company, Ltd., Waterloo, Que., suffered burns, fortunately not of a serious character, on October 2. He had emptied the water from a bucket, in which certain utensils used in the mixing of composition had been kept, and was engaged in cleaning out the bucket when some composition adhering to it flashed. It transpired that the bucket had been emptied, but not properly cleaned out, when operations had been temporarily sus-

pended a few weeks previously. Small quantities of composition, detached from the dirty tools, had thus been allowed to dry and stick to the bottom of the bucket and remained, in part at least, proof against the action of the water when the bucket was again taken into use. These were fired when an incautious attempt was made to remove them by scraping.

At the Brownsburg factory of the Canadian Industries, Ltd., on March 17, an operator omitted to insert a sulphur plug in one of a batch of waterproof electric detonators which he was "capping," with the result that this detonator fired when he poured in the hot sealing compound. The others in the block did not fire. The operator sustained slight burns on the hand.

Other accidental explosions or fires at this factory, and which were not attended by injury to personnel, are of interest.

One of these, an explosion in a "jelly bag" mixer, was precipitated by the breaking of the cord by means of which the operator, from behind cover, transmits a gentle up and down motion to the bag, thereby mixing the fulminate and chlorate ingredients of a priming composition. A small lead weight, in a silk covering sewn to the underside of the bag, served to fully extend it in initial position after having been reversed for emptying. On the breaking of the cord this weight, falling on the wall of the cone-shaped container, no doubt gave a blow to part of the composition and exploded the charge. The use of the weight has been discontinued. The wall in front of the mixer was slightly sprung outwards by the explosion, but the "jelly bag" in the adjoining semi-circular shield was not damaged.

An explosion, which when traced to its source proved very instructive, occurred at the machine used for the insertion of previously assembled "battery pockets" and primers in empty shotgun cartridges. In this machine the empty cartridges, or "shells," are carried in a revolving dial under, in turn, a heading punch, an attachment for the automatic insertion of battery pockets and a seating punch. The battery pockets (containing the primers) are carried in a hopper and fed automatically therefrom down a slide and into position for insertion in the shells as already indicated. It was established that the nipple of the heading punch had broken and the point of it had been left in the head of a shell. This obstruction prevented, at the next stage, the complete insertion of the battery pocket, the primer in which was then fired when brought under the descending seating punch. The flash passed to the other battery pockets on the slide and thence to those in the hopper. A violent explosion followed; the hopper and supporting castings were wrecked. The hopper being at the back of the machine the operator was shielded by the machine itself, but further protection has since been provided by the addition of shields. The recovery of the shell, with base marked by the explosion and containing the nipple of the punch, placed the cause of the explosion beyond doubt. The exceptional feature of the accident, however, was not the flashing, from one cause or another, of a battery pocket, but the communication of flash to battery pockets in the slide, and of explosion to the mass in the hopper. This contingency has now been met by changes made in the feed to interrupt the train and by the interposition of small flash screens.

A tetryl sieving and grading building was gutted by fire, which originated near that outlet of the grading machine through which the "fines," which have passed the screen of smallest mesh, are discharged. The grading of a batch of 25 pounds having been completed, the operator had just returned to the room, after switching off the motor in the annex, when he observed flames at this point. Subsequent examination of the remains of the machine disclosed that part of the wooden carrier frame had rubbed against the top of the receptacle for the "fines." Although badly charred it showed a distinctly polished edge, and the continued rubbing, of which this was evidence, no doubt generated sufficient heat to start combustion of the tetryl dust. The rubbing parts were not exposed to view, nor would it be possible, amid the noises of the machine in operation, to detect any due to the rubbing of the carrier.

MAGAZINES

The number of magazines under licence at the end of the year was 349, an increase of 1, and the number of temporary magazine licences issued showed a decrease of 41, being 195. This is attributable to a noticeably lessened activity in construction work.

Inspection of the permanent magazines of dealers and others has shown, generally, a good observance of the regulations and terms of licence, infractions being limited to relatively minor matters which were promptly rectified. On the other hand it is rather remarkable that the need of some small repair to a building itself, neglect of which may lead to its serious deterioration and consequent damage to its contents, is frequently passed unheeded until brought to notice by an inspector. Some owners, however careful they may be of the maintenance of their main business premises, appear to neglect personal inspection of their own magazines. Another consideration, the importance of which is not always fully appreciated by the employee who normally visits the magazine, is that of the disposal of any old deteriorating stock which, as often as not, has been returned to the dealer by customers. When such is found in an exuding or unusable condition by an inspector, it is condemned and destroyed but, by that time, some of it may be so deteriorated as to add to the difficulty of its safe removal and, most troublesome of all, nitroglycerine may have exuded to the extent of impregnating part of the flooring.

Besides a stock of 28 cases (1,400 pounds) damaged by water, and two other lots, totalling 29 cases (1,450 pounds) of old and obsolete explosives, which were destroyed, 5,125 pounds of dynamite, 175 pounds of gunpowder and 100 detonators, distributed over 18 magazines, permanent and temporary, were condemned and destroyed.

Temporary magazines are, in the main, those required for use on road and other construction work, in logging districts, in operations of a temporary character generally or to meet the requirements of the initial stages of development of an explosive-using industry for which, later, more permanent arrangements may be made. Temporary magazine licences were so issued in respect to the magazines established by the several mining companies operating in the Great Bear Lake district. Advantage was

taken of an opportunity which arose for these to be visited by Lieut-Colonel F. E. Leach, Inspector of Explosives. In all cases it was found that good provision had been made for the storage of explosives, and that among those handling the explosives was a good leavening of men whose experience had been gained in the well-conducted mines of the chief mining provinces. This was especially reassuring for it will have been seen, from references in these annual reports of the Division, that the locating and destruction of old explosives, abandoned by mining and prospecting parties with apparently less sense of responsibility, has frequently occasioned much work, and not free from danger, to the detachments of the Royal Canadian Mounted Police in the Northwest Territories.

To meet the situation created by the distribution of explosives at numerous camps, established by Provincial governments for men employed on road construction, the licences were framed, as indicated in the last report, to permit of some liberty of action to engineers in charge of groups of camps in effecting the necessary changes of location of magazines as the work progressed. Many inspections were made of the temporary magazines so established, and any recommendations made by inspectors were welcomed and followed by the district engineers. With their necessarily very limited complement of trained men available for the camps, and the large quantities of explosives to be transported, stored and used, theirs was not a light responsibility. Errors, due to carelessness or ignorance on the part of the man in charge of explosives at any particular camp, where found, were drawn to the attention of the engineer in district charge, as well as to the individual immediately concerned, and it was gratifying to observe, on later visits to other camps, that appropriate instructions had been passed to all. This prompt correction of any irregularities which did come to notice, coupled with that orderliness which was the prevalent feature, was best testimony of the supervision exercised.

Inspectors of the Division made 434 visits of inspection to magazines and 246 were made by deputy inspectors of the Royal Canadian Mounted Police. Satisfactory reports on the maintenance of twelve magazines, in outlying districts, were also rendered by the courtesy of the Commissioner of the British Columbia Provincial Police.

THEFTS FROM MAGAZINES

Increased frequency in thefts from magazines was noted in the last annual report, 15 magazines having been forcibly entered during the year 1931 and approximately 5,500 pounds of dynamite and 1,500 detonators stolen. The record for 1932, unfortunately, does not show improvement. In that year 19 magazines were broken into, three of them on two occasions, with a total loss of approximately 5,100 pounds of dynamite, 19,000 detonators and 24 quarts of nitroglycerine.

Five of these thefts were of quantities of 5 cases (250 pounds) or more: 1,250 pounds from a contractor's magazine, 1,100 from one magazine at a government road construction camp, and 250 pounds also 13,000 detonators from a second, and quantities of 800 pounds, 400 pounds and 300 with 1,000 detonators from dealers' magazines. The lot of 800 pounds was recovered.

Major thefts, such as these, suggest that the purpose was to profit by sale. Some of the thefts of the smaller quantities were no doubt effected with a view to later criminal use, but consideration of the particular explosives taken, and of attendant circumstances in each case, points to the small lots taken having been destined usually for normal uses. In so far as regards the public safety, ground for concern lies primarily in the criminal activities of which some of these thefts may be the precursors, nevertheless, whatever their ultimate purpose, the loss to the owners affected is the same, and the risk of like loss breeds some anxiety in others. Several of the strongest magazines in the country have been forced, as well as the more temporary structures as in use on construction works. The permanent type of magazine is to be found in some isolated location outside the town in which the dealer's place of business lies. Many such are only visited when an order has to be filled—which may be infrequently—so that opportunity for forcing the best of locks is not lacking. Not many dealers have at their disposal a personnel which would permit of frequent visits of inspection being made, at irregular intervals, to their magazines, although some might succeed in lessening the risk by such means. The maintenance of watchmen would entail an expense out of all proportion to the risk of loss by theft.

In the case, however, of temporary magazines the risk of theft could often be considerably lessened were frequent patrols made to the magazines. These magazines, while sufficiently distant from, are invariably within easy reach of the camps and, with the number of men available, it should not be difficult to so arrange. This is the practice in some cases and, in a few, watchmen are kept, but in others there has been observed a tendency to view the explosives magazine as something apart from the other adjuncts of a camp, and to be left to practically the sole care of the man in charge of blasting operations.

EXPLOSIVES FOUND

Two caches of old explosives were located in the Northwest Territories and destroyed by the Royal Canadian Mounted Police. One comprised 13 cases of dynamite and a 25-pound canister of powder, and the other 3 cases of dynamite. Another lot of 5 cases was found by the police when executing a search and destroyed. These cases had been stolen and secreted a few years previously. In four other instances explosives were found, in quantities of 30 pounds or less, in the course of police search, or in the unlawful possession of a man being arrested on a criminal charge. These findings by the police amounted to 1,133 pounds of dynamite, 25 of gunpowder and 75 detonators. Other small quantities, handed over to the police by the finders, or reported to them and recovered, totalled 85 pounds of dynamite and 200 detonators. Some interest attaches to the varied ways in which these hidden dangers are uncovered.

The findings of a few sticks of dynamite with detonator and burned out fuse at a meeting house lent the appearance of an attempted outrage, but whether one had been intended is very doubtful. In another case the new occupier of a house found 10 pounds of old explosives on his premises,

and in a third a workman uncovered, in a sand pit, a like quantity which, there is reason to believe, had been stolen from a magazine in the neighbourhood three years ago. In all other cases the explosives were found in the open apparently cached or forgotten by work parties or other users. A peculiar instance of this was brought to light in the James Bay district by a constable of the Royal Canadian Mounted Police who followed up rumours heard from Indians. In the result it appeared that two prospectors, on leaving the district two years ago, had disposed of about 15 pounds of dynamite, 100 detonators and some fuse by packing them in a gasoline tin, and placing that in a sack which was hung on a tree alongside an Indian trail. In time the sack rotted and fell to the ground. It wanted but a light-hearted wayfarer to kick the obtruding can to bring disaster. Fortunately this hazard was removed. Usually persons finding abandoned explosives report the matter to the police, who promptly collect and destroy them, but as in the instance just given, much is owing to the diligence with which vague information is followed up. As, again, in a settled part of the country rumour, that some explosives had been heard of in the neighbouring bush, led to the tracing of some ten pounds of dynamite and detonators discovered by a young lad and held for his leisured amusement—happily not consummated.

UNLICENSED PREMISES

The regulations relating to the keeping of small quantities of explosives were found, on inspection, to be well observed by hardware and other dealers. Minor infractions, occasionally found, were remedied on the representation of the inspector. In the course also of the rounds of inspections made there are always discovered some new stores, or stores under new management, where non-compliance with the regulations is attributable to ignorance. In these the instructions given were readily followed. Inspectors of the Division made 763 inspections of unlicensed premises and over 2,100 were made by deputy inspectors of the Royal Canadian Mounted Police.

From stores for explosives temporarily established by a railway company to meet emergencies occasioned by landslides, 18 cases (900 pounds) were stolen. One case was stolen from a truck conveying explosives, and thefts from five detached stores amounted to 187 pounds of explosives and 312 detonators.

IMPORTATIONS

The quantities of explosives, of the several classes, imported during the year are given in Appendix C. These importations were made under the authority of 379 permits and 46 special permits.

With the exception of detonating fuse, safety fuse, and nitroglycerine, the importations of explosives substances, other than what is destined for use in manufacture, are small.

Considerable quantities of manufactured fireworks are imported, although this year the amount was about 25 per cent less than during the previous year. Approximately three-fourths of the imported fireworks

are from China, and their examination is carried out at Vancouver by the Dominion Analyst in co-operation with the Customs officer and deputy inspectors of explosives of the Royal Canadian Mounted Police, as well as at Ottawa. Of Chinese fireworks presented slightly over 5 per cent were found unsatisfactory and refused entry.

AUTHORIZATION OF EXPLOSIVES

Ten explosives were added to the authorized list (Appendix E), and changes in the formulæ of 31 others were approved after examination. Four explosives, no longer being manufactured or in use, were removed from the list. Two varieties of fireworks submitted were refused authorization.

Inclusive of those examined by the Dominion Analyst at Vancouver, 308 samples of fireworks presented for importation were examined. Of these 55 were found unacceptable.

PROSECUTIONS

The driver of a truck was convicted on a charge of conveying detonators together with dynamite and was fined. Proceedings were also taken against a magazine owner who had operated a magazine without a licence. He was fined.

ACCIDENTS

The number of casualties occasioned by the use of explosives approximates to the record of the previous year, 22 killed and 144 injured in 1932, and 27 killed and 133 injured in 1931. These were attributable to a variety of causes as may be seen by reference to Appendix D, but most marked is the frequency of accidents arising from projected debris or failure to take proper cover in the course of operations elsewhere than in mines and quarries. Five were killed in this way each year, but the number of injured rose from 35 to 50. It is impossible to gauge how many of these could fairly be classed as avoidable accidents, but they should be more easily reducible by ordinary precautionary measures than others associated more intimately with the manipulation of the explosives. The withdrawal of the workers, when a shot is to be fired, may be fully adequate having regard to the normal and expected distribution of debris, but an added factor of safety might well be allowed in view of the possible recurrence of exceptional projection as has been known. Some old hands, who have enjoyed long immunity, are prone to cut the factor of safety very close. This tendency is to be suspected also as in part accounting for the so-called "prematures"—more usually failing to get away from the shot hole—and in those given as "returning too soon".

In so far as regards the particular hazard attendant on projected debris, it may be said that the men of a work party, given warning of a shot, can look after their own safety, but if new to the work they would naturally take only such measures as were taken by the old hands,

and, did their common sense prompt a greater precaution, the fear of the ridicule of their fellows would have a restraining influence. In such a situation the superintendent of the operations may have a somewhat difficult disciplinary task to secure observance, at all times, of precautionary measures which would be dubbed "grandmotherly" by the old powder man.

Considered in relation to the consumption of explosives, the occurrence of casualties in their use elsewhere than in mines is very marked, being over five times their frequency in mines and quarries. In the previous year the relative frequency was about three to one. In the mine there is strict discipline and enforcement of regulations, designed, in so far as is possible, to safeguard the lives of all. Mining men, other than the actual shot-firers, have an understanding of the hazards involved which is not to be expected of the labourers employed in construction work above ground. The situation is more akin to that of a group of workers in an explosives factory where, even were the operations not regulated and supervised as they are, no individual, necessarily appreciating the dangers of his occupation, would tolerate any observed carelessness on the part of a fellow worker.

In the general use of explosives, on the other hand, the safety of the party is dependent practically entirely on the skill, care and consideration of the shot-firer. The last two attributes, if not very pronounced, may be more fully developed by the insistence of the employer.

Stressing the importance of supervision over shot-firers may appear to reflect on them as a class. This is not the intention, but just as among a multitude of skilful and careful chauffeurs are to be found some inclined to reckless driving, so may be found shot-firers who are not of the necessary, and happily more prevalent, standard of efficiency and carefulness. Because of these the employer is well advised who subjects the operations of a new shot-firer to that same critical observation he would exercise over the driving of a newly engaged chauffeur before, with easy mind, leaving him to his own devices.

The majority of accidents attributed to causes other than those discussed in the foregoing are more local in effect, and the shot-firer, unless he be working with a helper, is the only person endangered. Unfortunately there are also cases wherein the presence of another does not prove a deterrent to risky procedure. Thus a man, using short lengths of fuse and lighting the fuse before inserting the charge had so lit and inserted two charges when, doubtful whether one had caught properly, he delayed to relight it. The other charge exploded and he was killed. His helper was also injured. Another shot-firer, kneeling over a box of explosives while preparing charges, by some misadventure brought about the explosion of the whole. He was killed, and his helper, too, was injured.

Of avoidable accidents those caused by lighting the fuse before inserting the charge are perhaps the most noticeable because of the quite unnecessary risk taken. They are invariably coupled with the use of short fuse, but in this dangerous economy of fuse is to be found a contributory cause of other accidents, as in some of those classed as "failing to get away from the shothole."

The importance of having the length of fuse straightened out before use was illustrated in the case of two prematures known to have been caused by the fuse, immediately on release after lighting, so springing back into a coil as to ignite the charge directly.

An accident of interest, in the constant watchfulness it enjoins, befell a fire boss who with a few electric detonators in his hand used that hand to move his safety light battery, so making contact with one of the detonators which fired inflicting minor injuries.

The initiation of explosion by lightning is not exceptional, but the explosion of a set charge in a mine 240 feet below the surface by this means is rather extraordinary. Information of this was given by the courtesy of the Department of Mines of the province concerned, and it appears that a round of charges had been connected up and the lead ends carried to a reel at the bottom of the shaft. The lightning struck a tree, then broke a cement post alongside of which was a pipe-line and so, apparently, to and down the shaft. Two men were killed.

Accidents arising from playing with explosives, mostly detonators, continue to bulk too largely in these records. During the year three lives were lost and 42 persons were injured from this cause, the corresponding figures for the preceding year being 3 and 50. The circumstances of these are given in brief in Appendix D. Accidents classed as "various," which cannot be regarded as occurring either in the use of explosives or while playing with them, are similarly treated. These were accountable for five deaths and injury to eight persons.

GENERAL

No one, reading these annual reports, can have failed to observe the variety and extent of the services rendered by the Royal Canadian Mounted Police in the enforcement of the regulations, or in co-operating with the Division in any matter bearing on the public safety and which touches on the handling of explosives. It will then be readily understood that the reorganization of that Force, consequent on its taking over the functions of Provincial police for Alberta, Manitoba, and the Maritime Provinces, is of special interest having regard to any effect it may have on the continuance of the aid given in the administration of the Explosives Act.

That effect promises to be most beneficial. The value of the work done by deputy inspectors—as are all members of the Force—is not to be gauged by statistical record, but it is worthy of note that, in spite of the many calls on the time of the personnel inseparable from a period of reorganization, there was no curtailment of the services rendered during that period. Inspections of magazines and of unlicensed premises stood at approximately the usual figure. It was further observed that, while fewer inspections were made in those regions where full compliance with the regulations was known to prevail, early advantage was taken of the establishment of new detachments to make more thorough inspections where, hitherto, opportunities for inspections had been infrequent.

The new distribution of detachments cannot but make for the exercise of a more uniform surveillance of stores throughout, but it is a greater asset,

and of which, too, there has already been evidence, in the added means it provides of giving service in other related matters which come under the purview of inspectors. Through the instrumentality of deputy inspectors with local knowledge may be achieved, in time, a diminution of those instances of abandoned explosives, followed by "explosives found" and accidents in playing with explosives, which have appeared so frequently in these reports. Their functions are many and varied; they elicit information regarding accidents and investigate the attendant circumstances; they obtain touch with temporary users of explosives who would not otherwise be met and control their disposal of explosives; they trace down abandoned explosives and undertake the task of their destruction; sometimes they appear in the rôle of investigators, at others in that of sympathetic instructors of the young; their watch over the movement of explosives leads to diverse tasks from examining importations of fireworks to escorting shipments of nitroglycerine. The increase in strength and the wider distribution of such personnel cannot but advance the basic purpose of the Explosives Act—the preservation of the public safety.

The conveyance of explosives in considerable quantities from railhead at Waterways along the 1,400-mile route of the Mackenzie River and Great Bear River to the new mining field on the eastern shores of Great Bear Lake gave rise to questions relating to the handling of explosives at portages, at points of transshipment and to their disposal during actual conveyance or while prolonged halts became necessary. The police detachments, with experience of the conditions under which the work had to be carried out, and appreciating the importance of deliveries being made, but sensible always to the paramount consideration of safety, were able, with the co-operation of the transportation companies, to ensure the best utilization of the available facilities, and to procure the adoption of various precautionary measures.

APPENDIX A

Factories Licensed to Manufacture Explosives in 1932

Owner	Location of factory	General nature of product	Remarks
Canadian Industries, Ltd.....	Beloeil, P.Q.....	Blasting explosives, black powders, propellants.	
Canadian Industries, Ltd.....	James Island, B.C..	Blasting explosives, black powders.	
Canadian Industries, Ltd.....	Nobel, Ont.....	Blasting explosives.	
Canadian Industries, Ltd.....	Brownsburg, P.Q...	Ammunition, detonators, etc.	
North Star Explosives Co., Ltd.	Prescott, Ont.....	Fulminate of mercury...	Operation intermittent.
Canadian Safety Fuse Co.....	Brownsburg, P.Q...	Safety fuse.	
T. W. Hand Fireworks Co., Ltd.	Dixie, Ont.....	Fireworks.	
Toronto Fireworks Co., Ltd..	Islington, Ont.....	Fireworks.	
B. Marroni.....	Ville St. Pierre, P.Q.	Fireworks.....	Operation intermittent.
Macdonald Metal Products Co., Ltd.	Waterloo, P.Q.....	Toy pistol caps.	

APPENDIX B

Production of Explosives in Canadian Factories during the year 1932

	Quantity
Class I. Gunpowder.....	380,006 lb.
“ II. Nitrate mixtures.....	625,225 “
“ III. Nitro-compounds—	
Division 1.....	31,340,515 “
“ V. Fulminates—	
Division 1.....	Output of one factory.
“ VI. *Ammunition—	
Division 1—	
Safety cartridges.....	135,479,766
Safety fuse.....	Output of one factory.
Railway torpedoes.....	Output of one factory.
Percussion caps.....	Output of one factory.
Division 3—	
Detonators and electric detonators.....	Output of one factory.
“ VII. Fireworks—	
Division 2.....	(approx. value) \$114,000

* Exclusive of artillery ammunition but includes small arms ammunition made in Government factories.

APPENDIX C

Explosives Imported into Canada, January 1 to December 31, 1932

Class	Division	Description	Quantity
II	Nitrate mixtures.....	150 lb.
III	1	Mixtures containing liquid nitro-compounds.....	7,375 "
	2	Nitro-compounds:—	
		(a) Propellants.....	118,157 "
		(b) For use in explosives factories.....	134,998 "
		(c) For other manufacturing purposes.....	538,687 "
VI	1	Percussion caps.....	303,050
	2	Safety fuse.....	1,229,172 feet
		Miner's squibs.....	131,000
		Detonating fuse.....	104,087 feet
	3	Detonators and electric detonators.....	5,200
VII	2	Manufactured fireworks.....	339,000 lb. (approx.)

APPENDIX D **Accidents from Explosives during the Calendar Year 1932**

Circumstances or Cause	In Mines and Quarries			Elsewhere			Total		
	Number of			Number of			Number of		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
I. Manufacture*									
II. Keeping.....				3		3	3		3
III. Conveyance (other than by railway).....									
Total, Manufacture, Keeping, Conveyance.....				3††		3	3		3
IV. Use and Miscellaneous—									
Shot, Firing—									
(a) Prematures, and failing to get away from shot hole.....	8	3	7	12	2	10	20	5	17
(b) Firing by electricity when persons are at the shot hole.....	1		1				1		1
(c) Not taking proper cover.....	3		4	16		17	19		21
(d) Projected debris.....	8		8	38	5	33	46	5	41
(e) Hangfires, and returning too soon to shothole.....	9		9	7		8	16		17
(f) Tampering with misfired shots.....	2	1	2	1		1	1		1
(g) Ramming or stemming the charge.....	3	1	2				2	1	2
(h) Sparks, flame, etc.....	3	2	7				3	1	2
(i) Boring into unexploded charges.....	6			1		1	7	2	8
(j) Striking unexploded charges in removing debris.....	3		3	2		5	5		8
(k) Preparing charges.....	2		2	2		4	6	1	6
(l) Lighting fuse before inserting charge.....	3		3	3	1	3	6	1	3
(m) Fumes.....	2	3	1				4	1	3
(n) Socketing or springing.....				4	1	3	4		1
(o) Thawing.....			5	1		4	1		1
(p) Various.....	4	2		2			6	2	9
†Miscellaneous—									
(a) Playing with detonators.....				24	2	28	24	2	28
(b) Playing with other explosives.....				11	1	14	11	1	14
(c) Various.....				9	5	8	9	5	8
Total use and miscellaneous.....	54	12	54	135	18	140	189	30	194
Total all circumstances.....	54	12	54	138	18	143	192	30	197

*Circumstances are given in text of report. ††Circumstances are given on next page.

† Except for these the accidents given in this table occurred in circumstances not directly controlled by the Act.

APPENDIX D—Continued

Playing with Detonators

Cause of Accident	Killed	Injured
Boy, age 16, found obsolete military detonators on lawn adjoining the unoccupied house of a retired officer, presumably abandoned there by burglars who had entered the house. He endeavoured to burn out the fuse. Part of finger and thumb of left hand were blown off by the explosion.		1
Man, age 24, was given a detonator by neighbour, both being ignorant of its properties. He tried to remove the composition with safety pin. It exploded. He lost thumb and first finger of left hand.		1
Boy, age 8, found some detonators. While playing with one near a stove, it exploded. The thumb and two fingers of left hand had to be amputated.		1
Girl, age 19, for eighteen months had used a detonator as a pencil protector. Her brother jammed the pencil into the detonator, while she held it in her hand. It exploded blowing off the top joints of three fingers and part of thumb of one hand and injuring her eyes.		1
Youth, age 19, was found on roadside by school children, badly mutilated by the explosion of a box of 100 detonators believed to have been taken from a road camp. He died of injuries.	1	
Youth, age 16, found detonators on shore of lake. He placed one on a boulder and struck it with a stone. He lost the thumb and forefinger of left hand.		1
Boy found detonator in trapper's old shack and applied a light to it. It exploded blowing off his hand.		1
Youth, age 18, found a detonator in an unoccupied building. He attached to it a train of twine and powder and lit this improvised fuse. It appeared to misfire but exploded when he approached to investigate. He received fragments of metal in leg and face.		1
Boy, age 10, lost two fingers and sustained injury to eyes by the explosion of a detonator which he had scratched with a nail. A younger brother received minor injuries. Investigation showed that the detonators were originally found in old brickyard by another boy. These had passed from boy to boy with the knowledge of the parents of three of them, who had not realized the danger.		2
Boy, age 12, suffered severe hand injuries when a detonator exploded while he was trying to open it.		1
Youth found cache of detonators on roadside. He raised his left hand to shift a cigarette and a detonator that he was holding at the time exploded. Thumb and three fingers of left hand were blown off.		1
Boy, age 12, exploded a detonator while playing with it. He suffered shock and serious injuries to his left hand.		1
Four boys, ages 8 to 10, found box of detonators cached or left in a barn and exploded it by throwing on paved road. One boy died from injuries, his three companions suffered shock and minor injuries.	1	3
Boy, age 6, found a detonator on the road and exploded it by striking it with a stone. He received injuries on the body and lost a finger.		1
Boy, age 11, attempted to pick the composition out of a detonator found with others in an unoccupied house. It exploded so injuring his left hand that amputation was necessary. A girl, age 4, suffered minor injuries. Other two companions escaped injury.		2
Boy, age 11, while playing with a detonator exploded it. Two fingers and thumb of left hand and one finger of right hand had to be amputated.		1
Boy found detonator which exploded while he was playing with it. He lost two fingers.		1
Boy found detonator and exploded it by placing on a paving block and throwing stones at it. The explosion caused a piece of brick to pierce the lip of a companion standing nearby.		1
Two boys, ages 11, found a detonator on the street and applied a match to it. It exploded. Both were injured about the arms and face.		2
Boy, age 15, found a detonator and scratched the composition with a knife. In the explosion which followed he lost four fingers of his right hand.		1

APPENDIX D—*Continued*

Playing with Detonators

Cause of Accident	Killed	Injured
Boy, age 10, took detonator from small supply kept by his father and applied a light to it. He received injuries which necessitated the amputation of three fingers and part of thumb of left hand. His right hand was badly cut.....		1
Youth, age 19, watched his younger brother trying to remove the composition from a detonator with a nail. Suddenly realizing the danger, he snatched the detonator from him. It then exploded and he lost the forefinger and thumb of his left hand. The younger brother was unhurt. The detonator had been found in the cellar of an unoccupied house.....		1
Boy, age 10, said he had been shot at by an unknown man, but investigation showed that he had been injured playing with a detonator. He lost thumb and two fingers of left hand, and suffered lacerations to right hand and face.....		1
Boy, age 10, was given a fused detonator by schoolmate whose father was a prospector. While trying to cut the fuse off with a knife the detonator exploded. He lost parts of three fingers of left hand.....		1
	2	28

Playing with Other Explosives

Cause of Accident	Killed	Injured
<i>Powders—</i>		
Two boys mixed sulphur and potassium chlorate, placed the mixture in a hole in a bed post and applied a light. There was no explosion, but both boys were severely burned.....		2
Two boys, ages 14, experimenting in a school laboratory, mixed ingredients to form gunpowder. The mixture exploded. They were both burned about the hands and face.....		2
Boy, age 12, dropped a lighted match in a can containing some gunpowder. The explosion which followed caused severe injuries to his face and eyes. Powder, found near a garage evidently left by owner (since dead) several years ago remained through tenancy of previous occupier and also of present one till accident.....		1
<i>Ammunition—</i>		
Boy, age 10, held a gun cartridge against kitchen stove. It exploded. He lost three fingers of his right hand.....		1
Boy, age 12, found railway torpedo and hit it with an axe. One eye was destroyed.....		1
<i>Dynamite—</i>		
Stick of dynamite fired in play in logging camp, caused injuries to one man who later died.....	1	
<i>Firecrackers—</i>		
Firecrackers exploded in hands of children.....		3
Injured by burns caused by firecrackers.....		4
	1	14

APPENDIX D—*Concluded*

Various Accidents

Cause of Accident	Killed	Injured
Woman threw hot ashes on floor of outside toilet under which dynamite had been cached, unknown to her, for nine years. While trying to extinguish the fire which followed, there was an explosion. She died of injuries...	1	
Youth, age 18, while experimenting with a toy cannon which exploded, suffered injuries to his face, arms and leg.....		1
Youth, was sharpening a plough point on a grindstone, with the heel of the casting resting against his leg, when 25 detonators he had in his trouser pocket exploded, causing severe injury to his leg.....		1
Two men in canoe had five sticks dynamite, detonators, and fuse. One man lit a cigarette and supposedly dropped match on explosives at his feet. Explosion followed immediately. He was killed and the canoe wrecked. The second man swam ashore.....	1	
Man, presumed to have been dynamiting fish, died from injuries received when a stick of dynamite exploded in his hand.....	1	
Man was adding wood to kitchen stove when an explosion occurred. He was enveloped in flames and died later of injuries. A brother and daughter were injured by minor burns in rescuing him. It is thought that there were explosives in the fuel.....	1	2
Man, dynamiting fish, failed to throw the fused stick of powder before it exploded. He was virtually blown to pieces.....	1	
Man was burning some rubbish which contained a shotgun cartridge. Explosion ensued and he was painfully injured in left hand, arm and side by projected lead pellets.....		1
Two men were sorting junk at a dump. One man picked up a cylindrical metal object, unscrewed one part of it and was pulling a string when it exploded. It is thought to have been a war souvenir. Both men were cut severely about face and legs, while a third man, standing sixty feet distant, was slightly injured.....		3
	5	8

APPENDIX E

Authorized Explosives

Explosives manufactured by Canadian firms as hereunder detailed:—

Burrowite Explosives Ltd.

Burrowites Nos. 1, 2, and 3.

Canadian Industries Ltd.

Polar dynamite—25, 30, 35, 40, 50, and 60 per cent and 40 and 50 per cent special.

Polar dynamite, mining—35, 40 per cent.

Polar ammonia dynamite—20, 25, 30, 35, 40, 50, and 60 per cent.

Polar ammonia dynamite, mining—20, 25, 30, 35, 40, 50, 55, and 60 per cent.

Polar gelatinized dynamite—50, 60, and 75 per cent.

Polar forcite gelatin—30, 35, 40, 50, 60, 75, 80, and 90 per cent, and 40 per cent special.

Polar forcite gelatin—Diamond—30, 35, 40, 50, 60, 75, 80, and 90 per cent.

Polar gelatin dynamite—30, 35, 40, 50, 60, 75, 80, and 90 per cent.

Special—No. 1.

Polar Monobel Nos. 4, 6, 7, and 12.

Polar CXL-ite No. 2.

Polar stumping No. 1 and Extra and "Blastol."

Gypsum A.

Gypsum B.

S.N.G.

Safety fuse lighters.

Signal bombs.

Cordite.

Black blasting powders.

Blackpowder pellets.

Gunpowder.

Sporting powders.

Safety fuse powder.

Canadian Safety Fuse Co., Ltd.

Safety fuse—"Clover" brand.

Safety fuse—"Black Clover" brand.

Safety fuse—"Beaver" brand.

Safety fuse—"White Jacket" brand.

Safety fuse—"Crown" brand.

Safety fuse—"Moose" brand.

Safety fuse—"Pacific" brand.

Dominion Cartridge Co., Ltd.

Ammunition.

Detonators.

Lead Azide.

Lead Trinitroresorcinate.

Percussion caps.

Railway torpedoes.

Electric detonators.

Railway fusees.

North Star Explosives Co., Ltd.

Fulminate of mercury.

APPENDIX E—*Continued***Authorized Explosives**

All explosives on the British authorized list are provisionally authorized in Canada, and in addition, those manufactured by the following firms, as detailed below:—

Aetna Explosives Co., Inc.

Standard dynamite L.F.—15, 20, 25, 27, 30, 33, 35, 40, 45, 50, and 60 per cent.

Straight dynamite—15, 20, 25, 27, 30, 33, 35, 40, 45, 50, and 60 per cent.

Keystone standard gelatin—40, 60, and 75 per cent.

Stumping powders—20 and 30 per cent.

American Glycerine Co.

Nitroglycerine.

American Powder Co.

American R.C. 22 short.

Atlas Powder Co.

Electric blasting caps, Nos. 6, 7, and 8.

Blasting caps, Nos. 6, 7, and 8.

Nitrocellulose.

Trinitrotoluene.

Brücker and Zinke.

Safety fuse—"Globe" brand.

Brücker and Zschetzsche.

Safety fuse—Black fuse "Triumph" brand.

White fuse "Triumph" brand.

California Cap Co.

Detonators.

Dumore National Chemical Co.

Regina stumping powder Nos. 1 and 2.

Regina rock powder Nos. 1 and 2.

E. I. Dupont de Nemours & Company, Inc.

Dupont bulk rifle powders (Nos. 80, 90, 91, 92) Rifle No. 1. Schuetzen.

Dupont smokeless shotgun powder.

Dupont pistol powders Nos. 3 and 5.

Dupont sporting rifle powders Nos. 95, 96, and 93.

Dupont military rifle powders (M.R. No. 20-23) Nos. 10, 21, 22, 30, 40, and 50).

Dupont gallery rifle powder No. 75.

Dupont Schultze smokeless shotgun powder.

Ballistite smokeless shotgun powder.

Improved military rifle powders Nos. 13, 15, 15½, 16, 17, 17½, 18, 23, 25, and 25½.

Dupont dense smokeless shotgun powder.

Fulminate of mercury.

Guncotton.

Trinitrotoluene.

Dynamite and blasting gelatin.

Agritol.

APPENDIX E—Continued**Authorized Explosives**

Ensign-Bickford Co.

Cordeau-Bickford fuse.

Hercules Powder Co.

Bullseye revolver powder.

Infallible smokeless shotgun powder.

Dynamite and blasting gelatin.

Illinois Powder Manufacturing Co.

Ammonia dynamite—40 and 60 per cent.

Powertol No. 1 and No. 3.

Independent Torpedo Co.

Nitroglycerine.

John R. Powell

Miners' squibs.

Puget Sound and Alaska Powder Co.

Gelatin dynamite—25, 30, 35, 40, and 60 per cent.

Dynamite, L.F.—20, 30, 40, and 60 per cent.

Special gelatin—25, 30, 40, and 60 per cent.

Straight gelatin—25, 30, 40, and 60 per cent.

Special stumping dynamite.

Special stumping dynamite—20 and 30 per cent.

Special dynamite—40 and 60 per cent.

Straight dynamite—40 and 60 per cent.

Safety Mining Co.

Cardox.

Trojan Powder Co.

Trojan Blasting CC.

Trojan TL 502.

Trojan 35 per cent standard.

Trojan 40 per cent standard.

Trojan 40C.

Trojan 50C.

United Railway Signal Corporation.

Railway torpedoes.

Western Cartridge Co.

Detonators.

Fireworks as manufactured by the following Canadian makers, namely:—

T. W. Hand Co., Ltd., and Dominion Fireworks Co.

Toronto Fireworks Co., Ltd.

Berardo Marroni.

Macdonald Metal Products Company, Ltd.

APPENDIX E—*Concluded***Authorized Explosives**

Certain fireworks manufactured by the following foreign makers, namely:—

Rochester Fireworks Company.
 M. Backes Sons, Inc.
 Hitt Fireworks Co., Inc.
 A. Jedel.
 Kilgore Manufacturing Co.
 National Fireworks, Inc.
 Victory Sparkler Co.
 Essex Specialty Co.
 Edwards Co.
 Federal Buster Corporation.
 Los Angeles Fireworks Co.
 Geb. Weinrich.
 Central Railway Signal Co.
 Fred. Wicke.
 Ying Shing Loong.
 M. Wagner.
 J. F. Eisfeld.
 International Fireworks Co.
 Edmiston Manufacturing Co.
 Adrian and Rohde.
 Hamburg-Bremer Handelgesellschaft.
 A. G. für Anilinfabrikation.
 Wilhelm Fischer.
 Potts Fireworks Display Co.
 Antonelli Fireworks Co.
 Safety Automatic Toy Co.
 American Fireworks Co.
 Blumberg & Co.
 Standard Railway Fusee Corp.
 Unexcelled Manufacturing Co., Inc.
 H. Nicolaus & Co.
 Continental Fireworks Manufacturing Co.
 Burke and James Inc.
 Coston Supply Co.
 Gerka-Werke.
 John G. Marshall.
 Norman Willets Photo Supply Co.
 New Jersey Flugent Co.

Also Chinese firecrackers with gunpowder composition and not exceeding 4 inches in length and nine-sixteenth inch in diameter and such other varieties the authorization of which has been specially notified to the parties immediately concerned.

